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Correlation Studies in Gladiolus (*Gladiolus hybridus* Hort.) Genotypes

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A B S T R A C T

A study on the association of various morphological traits through correlation analysis in gladiolus (*Gladiolus hybridus* Hort.) showed that Number of spikes per plant had a significant and positive correlation with number of leaves, number of shoots and number of daughter corms per plant in genotypic level. Spike length exhibited positive and significant association with rachis length, number of florets vase life and number of cormels. Number of florets exerted a significant positive correlation with vase life at genotypic and phenotypic level. Hence, these characters may be considered as selection indices in gladiolus breeding programme.

Introduction

Gladiolus (*Gladiolus hybridus* Hort.) is an important bulbous ornamental prized for its beauty of spikes as well as longer vase-life and said to be "Queen of bulbous flower crops". In International florist trade, it ranks fifth next to tulip, lily, freesia and hippeastrum among the geophytes and first in domestic bulbous flower trade according to Council of Holland. It is extensively grown in hills and plains almost all over the world.

There are many excellent cultivars of gladiolus with magnificent inflorescence, in exhaustive range of colours, different shades, varying number of florets, size, wide range of keeping quality and adaptability to different seasons. It is relatively easy to grow and is ideal for bedding and exhibition purposes. The spikes are used in vase arrangements, in bouquets and for indoor decorations. Popularity of this crop as a cut spike is increasing day by day because of its long keeping quality and exhaustive range of colours of the spikes.

In any crop improvement programme, it becomes necessary to have simultaneous progress of more than one character, especially in the case of complex character like yield, which is influenced by many other traits. This is due to the physiological and linkage relationship of genes governing various characters. Hence, knowledge of correlations between different economical traits is of importance in selection programmes.

Materials and Methods

The present investigation was carried out at the Department of Floriculture and Landscape Architecture, Kittur Rani Channamma College of Horticulture (University of Horticultural Sciences, Bagalkot), Arabhavi, Gokak taluk, Belagavi district of Karnataka during the period of 2015 to 2017. Forty gladiolus genotypes collected from diverse source were used in the study presented in Table 1. The experiment was laid out in randomized block design (RBD) with two replications.

Genotypic (r_g) and phenotypic (r_p) correlation coefficients were estimated as suggested by Al-Jibourie *et al.*, (1958)

Genotypic correlation = $r_{xy}(g) = \frac{Co\,V\,xy\,(G)}{\sqrt{Vx\,(G) \times Vy(G)}}$

Phenotypic correlation = $r_{xy}(p) = \frac{Co\,V\,xy\,(P)}{\sqrt{Vx\,(P) \times Vy(P)}}$

Where,

CoVxy (G) = Genotypic covariance between x and y

CoVxy (P) = Phenotypic covariance between x and y

Vx (G) = Genotypic variance of character x

Vx (P) = Phenotypic variance of character x

Vy (G) = Genotypic variance of character y

Vy (P) = Phenotypic variance of character y

Test of significance of correlation was tested by comparing the 'r' value with obtained value.

Results and Discussion

The analysis of phenotypic and genotypic correlation of yield and yield components were worked out for the twelve important quantitative characters using mean data generated from 40 genotypes raised during two continuous seasons from 2015-17, and the pooled analysis of both seasons presented in Table 2 and 3.

Changes in yield must be accompanied by changes in one or more of its components. In the present investigation, it was observed that genotypic correlation coefficients were found to be higher than corresponding phenotypic correlation coefficient for all the characters indicating little influence of environment and the presence of a strong inherent association between various characters. In most of the cases genotypic and phenotypic correlation coefficients were similar in direction (Mishra *et al.*, 2014, Choudhary *et al.*, 2011 in gladiolus).

Number of spikes per plant had significant and positive correlation with number of leaves, number of shoots and number of daughter corms per plant in genotypic level which indicated that selection based on these characters would increase spike yield. Negative and significant correlation was

expressed for yield trait with days to spike emergence, leaf area per plant and plant height at both genotypic and phenotypic levels. The results are in accordance with Mishra *et al.,* (2014), who reported that number of spikes per plant had significant and positive correlation with number of sprouts and number of corms per plant in gladiolus. Aido *et al.,* (2014) in gladiolus also quoted that the magnitude of correlation with flower yield was highest in number of leaves at spike initiation stage. Geeta (2013) and Sahana (2010) also reported that number of spikes per plant had significant positive correlation with number of daughter corms and negative correlation with plant height, leaf area and days to spike emergence in gladiolus.

Plant height showed significant and positive correlation with weight of corm before planting, leaf area per plant, spike length, rachis length, number of cormels and vase life. This indicated that the plant height is an important trait for quality spike production, selection of genotypes based on these characters is important. Similar results were obtained by Ramzan *et al.,* (2016), Katwate *et al.,* (2002), Maitra and Sathya (2004) and Choudhary *et al.,* (2011) in gladiolus.

Selection of taller plants and large spikes will therefore simultaneously improve post harvest life of the spike, which is one of the most important quality characters of gladiolus flower. Katwate *et al.,* (2002) found that rachis length exhibited significant positive correlation with plant height and number of florets per spike indicating that the increased plant height will result in increased rachis length thereby improving the value of genotype. It was significant and negatively associated with number of shoots, number of leaves and number of spikes per plant. This is in conformity with the results of Geetha *et al.,* (2014) and Sahana *et al.,* (2010) in gladiolus. So selection of genotypes which have higher plant height will increase the value of a genotype in terms of spike quality. Number of shoots had positive and significant correlation with number of leaves, number of daughter corms per plant while, leaf area and days to spike emergence showed significantly negative correlation with number of shoots which indicated that direct selection of genotypes based on these characters can be done to increase the number of shoots. Similar results were reported by Vetry *et al.,* (2017) in gladiolus. A non significant negative correlation was observed by number of cormels per plant with number of shoots. This consequence is in comparison with the results reported by Mishra *et al.,* (2014) in gladiolus.

Number of leaves expressed significant positive correlation with number of spikes, number of daughter corms per plant and significantly negatively associated with leaf area per plant and days to spike emergence. The results are in accordance with Aido *et al.,* (2014) and Nimbalkar *et al.,* (2007) in gladiolus.

A significant positive correlation was exerted by spike length with weight of corm before planting, plant height, leaf area, rachis length, vase life, number of florets per spike and number of cormels. Similar findings were made by Maitra and Sathya (2004) and Choudhary *et al.,* (2011) in gladiolus. It shows that spike length, which is an important attribute of cut flower quality, can be increased with increase in any one of these characters, specially the height of the plant, number of florets per spike and corm weight. Similarly, the market value and marketability of gladiolus spikes depends upon the number of florets per spike, floret size and number of florets open at a time and as these characters had positive correlation with spike length, so a direct selection from germplasm lines may be effective for the improvement of this crop.

Table.1 Details of gladiolus genotypes used in the experiment

S. No	Genotype	Origin	Source
1.	Summer Sunshine	Holland	Jammu & Kashmir
2.	Delhi Local	India	Jammu & Kashmir
3.	Green Bay	USA	Jammu & Kashmir
4.	Copper King	USA	Jammu & Kashmir
5.	Dhanvantari	-	IARI, New Delhi
6.	JesterYellow	Holland	Jammu & Kashmir
7.	LocalYellow	India	Bengaluru
8.	Arka Amar	IIHR	IIHR, Banglore
9.	Arka Naveen	IIHR	IIHR, Banglore
10.	Arka Arti	IIHR	IIHR, Banglore
11.	Darshan	India	IIHR, Banglore
12.	Jyostna	-	IARI, New Delhi
13.	Suchitra	-	IARI, New Delhi
14.	Magma	-	Navsari, Gujrat
15.	Urmil	-	IARI, New Delhi
16.	White Prosperity	USA	Jammu & Kashmir
17.	Pusa Kiran	IARI	IARI, New Delhi
18.	Sindur	-	IIHR, Banglore
19.	Arka Thilak	IIHR	IIHR, Banglore
20.	Punjab Dawn	India	Navsari, Gujrat
21.	African star	-	IARI, New Delhi
22.	Local pink	-	Bengaluru
23.	Pusa Vidushi	IARI	IARI, New Delhi
24.	Legent	-	IARI, New Delhi
25.	Chandini	-	IARI, New Delhi
26.	Mohini	NBRI	IARI, New Delhi
27.	Hunting Song	-	IARI, New Delhi
28.	Golddust	-	IARI, New Delhi
29.	Surya Kiran	-	IARI, New Delhi
30.	Sunayana	-	Navsari, Gujrat
31.	Gunjan	-	PAU, Ludhiana
32.	Novalux	-	PAU, Ludhiana
33.	Punjab glance	India	IARI, New Delhi
34.	Anjali	IARI	Navsari, Gujrat
35.	Shagun	-	IARI, New Delhi
36.	Priscilla	-	IIHR, Banglore
37.	Arka Sagar	IIHR	IIHR, Banglore
38.	Arka Kesar	IIHR	IIHR, Banglore
39.	Arka Gold	IIHR	Jammu & Kashmir
40.	Candyman	USA	Jammu & Kashmir

Table.2 Genotypic correlation coefficient for growth, flowering, yield and quality parameters in gladiolus genotypes

	WCP	PH	NS	NL	LA	DSE	SL	RL	NF	VL	NDC	NCr	NSp
WCP	1.000	0.499**	-0.190	-0.300**	0.574**	-0.025	0.664**	0.629**	0.522**	0.587**	-0.200	0.485**	-0.091
PH		1.000	-0.399**	-0.283*	0.807**	0.062	0.640**	0.388**	0.151	0.219*	0.002	0.365**	-0.272*
NS			1.000	0.833**	-0.492**	-0.326**	-0.052	0.144	0.205	0.187	0.260*	-0.212	0.774**
NL				1.000	-0.464**	-0.434**	-0.009	0.151	0.189	0.168	0.388**	-0.142	0.942**
LA					1.000	0.135	0.762**	0.450**	0.359**	0.410**	0.023	0.404**	-0.398**
DSE						1.000	-0.017	-0.029	-0.134	-0.126	-0.149	0.334**	-0.491**
SL							1.0000	0.830**	0.672**	0.723**	0.157	0.426**	0.027
RL								1.0000	0.793**	0.819**	0.045	0.508**	0.190
NF									1.0000	0.972**	-0.067	0.264*	0.190
VL										1.000	-0.044	0.267*	0.192
NDC											1.000	0.182	0.228*
NCr												1.000	-0.214
NSp													1.000

Critical r_g value = 0.219 at 5 per cent and 0.286 at 1 per cent
* and ** indicate significant at 5 and 1 per cent probability level, respectively

WCP – Weight of corm before planting (g)
PH - Plant height (cm)
NS - Number of shoots
NL - Number of leaves
LA - Leaf area (cm^2)
DSE - Days to spike emergence
SL - Spike length (cm)
RL - Rachis length (cm)
NF - Number of florets
VL - Vase life (days)
NDC - Number of daughter corms per plant
NCr - Number of cormels per plant
NSp – Number of spikes per plant

Table.3 Phenotypic correlation coefficient for growth, flowering, yield and quality parameters in gladiolus genotypes

	WCP	PH	NS	NL	LA	DSE	SL	RL	NF	VL	NDC	NCr	NSp
WCP	1.000	0.419**	-0.109	-0.122	0.447**	-0.043	0.539**	0.531**	0.393**	0.476**	-0.115	0.393**	-0.021
PH		1.000	-0.259*	-0.169	0.775**	0.062	0.551**	0.316**	0.092	0.165	-0.008	0.324**	-0.239*
NS			1.000	0.805**	-0.303**	-0.125	-0.013	0.108	0.144	0.138	0.189	-0.198	0.688**
NL				1.000	-0.301**	-0.192	0.025	0.122	0.135	0.133	0.279*	-0.135	0.791**
LA					1.000	0.096	0.648**	0.374**	0.241*	0.301**	0.027	0.359**	-0.307**
DSE						1.000	0.010	-0.013	-0.078	-0.088	-0.141	0.140	-0.312**
SL							1.000	0.828**	0.659**	0.704**	0.148	0.336**	0.012
RL								1.000	0.773**	0.797**	0.082	0.399**	0.142
NF									1.000	0.947**	0.004	0.174	0.149
VL										1.000	0.015	0.215*	0.156
NDC											1.000	0.122	0.186
NCr												1.000	-0.206
NSp													1.000

Critical r_g value = 0.219 at 5 per cent and 0.286 at 1 per cent
* and ** indicate significant at 5 and 1 per cent probability level, respectively

WCP – Weight of corm before planting (g)
PH - Plant height (cm)
NS - Number of shoots
NL - Number of leaves
LA - Leaf area (cm^2)
DSE - Days to spike emergence
SL - Spike length (cm)
RL - Rachis length (cm)
NF - Number of florets
VL - Vase life (days)
NDC - Number of daughter corms per plant
NCr - Number of cormels per plant
NSp – Number of spikes per plant

Rachis length was significantly and positively correlated with vase life, number of florets per spike and number of cormels per plant. This result is in accordance with the findings of Raj *et al.,* (1998), Choudhary *et al.,* (2011), Anju and Ranvir (2012) and Anwesha and Ratha (2015) in gladiolus.

On the basis of findings of the present experiment the following conclusion may be drawn, most of the characters have higher genotypic correlation coefficent than phenotypic correlation coefficent. For improvement of spike yield through selection, much emphasis should be given on the characters like number of leaves, number of shoots and number of daughter corms per plant.

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